HALL TICKET NO. | | | | | | | |

SET CODE : **T2**

BOOKLET SL.NO. 214106

NAME OF THE CANDIDATE

BOOKLET CODE : **B**

SIGNATURE OF THE CANDIDATE

INVIGILATOR'S SIGNATURE

(EEE) ELECTRICAL AND ELECTRONICS ENGINEERING

INSTRUCTIONS TO CANDIDATES

1. Candidates should write their Hall Ticket Number only in the space provided at the top left hand corner of this page, on the leaflet attached to this booklet and also in the space provided on the OMR Response Sheet. **BESIDES WRITING, THE CANDIDATE SHOULD ENSURE THAT THE APPROPRIATE CIRCLES PROVIDED FOR THE HALL TICKET NUMBERS ARE SHADED USING BALL POINT PEN (BLUE/BLACK) ONLY ON THE OMR RESPONSE SHEET. DO NOT WRITE HALL TICKET NUMBER ANY WHERE ELSE.**
2. Immediately on opening this Question Paper Booklet, check:
   (a) Whether 200 multiple choice questions are printed (**50** questions in Mathematics, **25** questions in Physics, **25** questions in Chemistry and **100** questions in Engineering)
   (b) In case of any discrepancy immediately exchange the Question paper Booklet of same code by bringing the error to the notice of invigilator.
3. Use of Calculators, Mathematical Tables and Log books is not permitted.
4. **Candidate must ensure that he/she has received the Correct Question Booklet, corresponding to his/her branch of Engineering.**
5. **Candidate should ensure that the booklet Code and the Booklet Serial Number, as it appears on this page is entered at the appropriate place on the OMR Response Sheet by shading the appropriate circles provided therein using Ball Point Pen (Blue/Black) only. Candidate should note that if they fail to enter the Booklet Serial Number and the Booklet Code on the OMR Response Sheet, their Answer Sheet will not be valued.**
6. **Candidate shall shade one of the circles 1, 2, 3 or 4 corresponding question on the OMR Response Sheet using Ball Point Pen (Blue/Black) only. Candidate should note that their OMR Response Sheet will be invalidated if the circles against the question are shaded using pencil or if more than one circle is shaded against any question.**
7. One mark will be awarded for every correct answer. **There are no negative marks.**
8. The OMR Response Sheet will not be valued if the candidate :
   (a) **Writes the Hall Ticket Number in any part of the OMR Response Sheet except in the space provided for the purpose.**
   (b) **Writes any irrelevant matter including religious symbols, words, prayers or any communication whatsoever in any part of the OMR Response Sheet.**
   (c) **Adopts any other malpractice.**
9. **Rough work should be done only in the space provided in the Question Paper Booklet.**
10. **No loose sheets or papers will be allowed in the examination hall.**
11. Timings of Test: 10.00 A.M. to 1.00 P.M.
12. **Candidate should ensure that he / she enters his / her name and appends signature on the Question paper booklet, leaflet attached to this question paper booklet and also on the OMR Response Sheet in the space provided. Candidate should ensure that the invigilator puts his signature on this question paper booklet, leaflet attached to the question paper booklet and also on the OMR Response Sheet.**
13. Before leaving the examination hall candidate should **return both the OMR Response Sheet and the leaflet attached to this question paper booklet** to the invigilator. Failure to return any of the above shall be construed as malpractice in the examination. **Question paper booklet may be retained by the candidate.**
14. This booklet contains a total of 32 pages including Cover page and the pages for Rough Work.

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Note: (1) Answer all questions.

(2) Each question carries 1 mark. There are no negative marks.

*(3) Answer to the questions must be entered only on OMR Response Sheet provided separately by completely shading with **Ball Point Pen (Blue/Black)**, only one of the circles 1, 2, 3 or 4 provided against each question, and which is most appropriate to the question.*

(4) The OMR Response Sheet will be invalidated if the circle is shaded using pencil or if more than one circle is shaded against each question.

MATHEMATICS

1. $\int\left(\frac{x+2}{x+1}\right)dx =$

(1) $x \log (x+1) + c$ (2) $x \log (x+1) + 2 \log (x+1) + c$

(3) $x + \log (x+1) + c$ (4) $\frac{1}{x}\log(x+1)+c$

2. $\int \frac{x^2}{\sqrt{1+x^6}}dx =$

(1) $\frac{1}{2}\sin^{-1}(x^3)+c$ (2) $2\cos^{-1}(x^3) + c$

(3) $\frac{1}{2}\cos h^{-1}(x^3)+c$ (4) $\frac{1}{3}\sin h^{-1}(x^3)+c$

3. $\int 8x^3 e^{2x}\,dx =$

(1) $(4x^3 - 6x^2 + 6x - 3)\,e^{2x} + c$ (2) $4x^3 + 6x^2 + 6x + 3e^{2x} + c$

(3) $\left(\frac{4x^2}{3} - \frac{2}{3}x + \frac{1}{3}\right)e^{2x} + c$ (4) $\left(\frac{4x^2}{3} + \frac{2}{3}x - \frac{1}{3}\right)e^{2x} + c$

4. $\lim_{n\to\infty}\left[\frac{1}{n} + \frac{1}{n+1} + \frac{1}{n+2} + \ldots + \frac{1}{3n}\right] =$

(1) $\frac{\pi}{3}$ (2) $\frac{\pi}{4}$ (3) $\log 2$ (4) $\log 3$

5. $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\cos x}+\sqrt{\sin x}}dx =$

(1) $\frac{\pi}{2}$ (2) $\frac{\pi}{4}$ (3) 0 (4) 2

6. The area of the region in the first quadrant enclosed by x-axis, y-axis, $y = 3x-2$ and $y = 4$ is

(1) 16 (2) 8 (3) $\frac{16}{3}$ (4) $\frac{8}{3}$

7. The root mean square (RMS) value of $\log x$ over the range $x = 1$ to $x = e$ is

(1) $\frac{\sqrt{(e+1)}}{\sqrt{(e-2)}}$ (2) $\frac{\sqrt{(e-2)}}{\sqrt{(e-1)}}$ (3) $\frac{\sqrt{(e+2)}}{\sqrt{(e+1)}}$ (4) $\frac{\sqrt{(e+2)}}{\sqrt{(e-1)}}$

8. The differential equation formed by eliminating the arbitrary constants a and b in the relation $y = a\cos(nx+b)$ is

(1) $\frac{d^2y}{dx^2}+n^2y=0$ (2) $\frac{d^3y}{dx^3}-x^3y=0$

(3) $\frac{dy}{dx}+ny=0$ (4) $\frac{d^2y}{dx^2}-y=0$

9. The solution of $\frac{dy}{dx}=e^{x-y}$

(1) $e^x-e^{-y}+c=0$ (2) $e^{x-y}+c$

(3) $e^x+e^{-y}+c=0$ (4) $e^x-e^y+e^c=0$

10. The solution of the differential equation $\tan x\frac{dy}{dx}+y=\sec x$ is

(1) $y\sin x-x=c$ (2) $y\cot x+x=c$

(3) $y=\tan x+c$ (4) $y.\operatorname{cosec} x=x+c$

11. The solution of the linear third order equation $\frac{d^3y}{dx^3} - 7\frac{d^2y}{dx^2} + 16\frac{dy}{dx} - 12y = 0$ is

(1) $y = c_1 e^{3x} + c_2 e^{x} + c_3 e^{4x}$
(2) $y = c_1 e^{3x} + c_2 x e^{x} + c_3 e^{4x}$
(3) $y = c_1 e^{2x} + c_2 x e^{3x} + c_3 e^{4x}$
(4) $y = c_1 e^{3x} + (c_2 + c_3 x) e^{2x}$

12. If $y_1 = e^x$ and $y_2 = e^{-x}$ are two solutions of the homogeneous differential equation; then

(1) $y_3 = e^{2x}$ and $y_4 = e^{-2x}$ are also solutions of the equation
(2) $y_3 = xe^{x}$ and $y_4 = xe^{-x}$ are also solutions of the equation
(3) $y_3 = \cosh x$ and $y_4 = \sinh x$ are also solutions of the equation
(4) $y_3 = \cos x$ and $y_4 = \sin x$ are also solutions of the equation

13. The particular integral (P.I) of the equation $(D^2+D-6)y = 5e^{2x} + 6$ is

(1) $xe^{2x} - 1$
(2) $e^{2x} + 1$
(3) $5xe^{2x} + 1$
(4) $e^{2x} - 1$

14. The particular integral of $(D^2+16)y = 8\cos 4x$ is

(1) $\cos 4x$
(2) $x \sin 4x$
(3) $-\frac{1}{4}\sin 4x$
(4) $-\frac{1}{4}\cos 4x$

15. If $A = \begin{bmatrix} 2 & 4 & 3 \\ 1 & 0 & 2 \\ -3 & 5 & 1 \end{bmatrix}$ then,

(1) $A = A^T$
(2) A is a diagonal matrix
(3) A is a singular matrix
(4) A is a nonsingular matrix

16. If $A=\begin{bmatrix}2 & 5 & 3\\ 3 & 1 & 2\\ 1 & 2 & 1\end{bmatrix}$ then

(1) The minors of first row elements are respectively $-3, -1, 5$
(2) The cofactors of second row elements respectively are $1, -1, 1$
(3) The cofactors of first row elements respectively are $-3, -1, -5$
(4) The minors of second row elements respectively are $7, 5, -13$

17. If A, B, C are non singular matrices of order 3 then

(1) $A(BC) \neq (AB)C$ (2) $(ABC)^T = A^T B^T C^T$
(3) $(ABC)^{-1} = C^{-1} B^{-1} A^{-1}$ (4) $(ABC)^{-1} = 1/(ABC)$

18. If $\begin{bmatrix}3 & 2\\ 2 & -3\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}4\\ 7\end{bmatrix}$, then

(1) $x=-1, y=4$ (2) $x=2, y=-1$
(3) $x=4, y=-1$ (4) $x=-1, y=2$

19. If w is the cube root of unity then $\begin{bmatrix}1 & w & w^2\\ w & w^2 & 1\\ w^2 & 1 & w\end{bmatrix}=$

(1) 0 (2) 1 (3) -1 (4) 2

20. If $\frac{x^2+13x+15}{(2x+3)(x+3)^2}=\frac{A}{2x+3}+\frac{B}{x+3}+\frac{C}{(x+3)^2}$ then C =

(1) 10 (2) 5 (3) 3 (4) 1

21. If $\frac{2x+1}{(x^2+1)(x-1)}=\frac{Ax+B}{x^2+1}+\frac{C}{x-1}$ then $A=$

(1) -1 (2) $\frac{2}{3}$ (3) $-\frac{3}{2}$ (4) $-\frac{2}{3}$

22. Which of the following statement is TRUE
(A) The period of $\sin x$ is π and the period of $\operatorname{cosec} x$ is 2π
(B) The period of $\cos x$ is 2π and the period of $\sec x$ is 2π
(C) The period of $\tan x$ is 2π and the period of $\cot x$ is π
(D) The period of $\operatorname{cosec} x$ is π and the period of $\sec x$ is 3π
(1) A (2) B (3) C (4) D

23. The range of $3\cos\theta - 4\sin\theta$ is
(1) $[-1, 1]$ (2) $[0, 4]$ (3) $[-5, 5]$ (4) $[-4, 0]$

24. If $A+B=45°$, then $(1+\tan A)(1+\tan B) =$
(1) 0 (2) 1 (3) $\frac{1}{2}$ (4) 2

25. $\left(\frac{\sin 2A}{1-\cos 2A}\right)\left(\frac{1-\cos A}{\cos A}\right) =$
(1) $\tan\frac{A}{2}$ (2) $\cos\frac{A}{2}$ (3) $\sec\frac{A}{2}$ (4) $\operatorname{cosec}\frac{A}{2}$

26. The value of $\frac{\sin 70° - \cos 40°}{\cos 50° - \sin 20°} =$
(1) 1 (2) $\frac{1}{\sqrt{2}}$ (3) $\frac{1}{\sqrt{3}}$ (4) 0

27. $4\sin\frac{11\theta}{2}\cos\frac{11}{2}\theta\cos 5\theta$ expressed as sum or difference is
(1) $\sin 15\theta - \sin 6\theta$ (2) $\sin 16\theta + \sin 6\theta$
(3) $\sin 11\theta + \sin 8\theta$ (4) $\sin 11\theta - \sin 8\theta$

28. If $2\cos^2\theta + 11\sin\theta = 7$, the principal value of θ is
(1) $60°$ (2) $45°$ (3) $30°$ (4) $22\frac{1}{2}°$

29. Which one of the following equation is FALSE

(1) $\cos^{-1}(-x) = \pi - \cos^{-1} x$ (2) $\sin^{-1}(-x) = \pi - \sin^{-1} x$

(3) If $-1 \le x \le 1$, then $\cos^{-1}x + \sin^{-1} x = \frac{\pi}{2}$ (4) $\sin^{-1}x \neq \frac{1}{\sin x}$

30. In any triangle ABC, $\Sigma (b+c) \cos A =$

(1) $a+b+c$ (2) $2(a+b+c)$ (3) $3(a+b+c)$ (4) 0

31. With the usual notation, in a triangle ABC

$$s\left[\frac{r_1 - r}{a} + \frac{r_2 - r}{b} + \frac{r_3 - r}{c}\right] =$$

(1) $2(r_1+r_2+r_3)$ (2) $3(r_1+r_2+r_3)$ (3) $r_1+r_2+r_3$ (4) 0

32. The modulus amplitude form of $-\sqrt{3} + i$ is

(1) $2 \text{ cis } \frac{5\pi}{6}$ (2) $2 \text{ cis } \frac{3\pi}{6}$ (3) $2 \text{ cis } \frac{\pi}{3}$ (4) $2 \text{ cis } \frac{\pi}{6}$

33. If $x = \cos\theta + i \sin\theta$, then the value of $x^6 + \left(\frac{1}{x^6}\right)$

(1) 0 (2) $2i \sin 6\theta$ (3) $2 \cos 6\theta$ (4) $2(\cos 6\theta + \sin 6\theta)$

34. The most general second degree equation $ax^2+2hxy+by^2+2gx+2fy+c = 0$ represents a circle if

(1) $a+b = 0, h = 0$ (2) $a-b = 0, h = 0$

(3) $a-b = 0, h \neq 0$ (4) $a+b \neq 0, h \neq 0$

35. The equation of the circle whose radius is $\sqrt{\left(a^2 - b^2\right)}$ and whose center is (–a, –b) is

(1) $x^2+y^2+2ax+2by+2a^2 = 0$ (2) $x^2+y^2-2ax+2(a^2+b^2) = 0$

(3) $x^2+y^2+2ax+2by+2(a^2-b^2) = 0$ (4) $x^2+y^2+2ax+2bx+2b^2 = 0$

36. The coordinates of the parabola $y^2 = 18x$ such that the ordinate equals to three times of the abscissa is

(1) (3, 9) (2) (2, 6) (3) (1, 3) (4) (162, 54)

37. With respect to the ellipse $5x^2+7y^2 = 11$, the point $(4, -3)$
(1) Is a focus
(2) lies with in the ellipse
(3) lies outside the ellipse
(4) lies on the ellipse

38. For the Hyperbola $4x^2-9y^2 = 36$, the coordinates of the foci are

(1) $\left(\pm\sqrt{13},0\right)$ (2) $\left(\pm\sqrt{31},0\right)$ (3) $\left(\pm6,0\right)$ (4) $\left(0,\pm6\right)$

39. Which of the following statements are FALSE
(A) The equation of the tangent at the point (x', y') of the circle $x^2+y^2 = a^2$ is $xx' + yy' = a^2$
(B) The eccentricity of a parabola is unity
(C) The eccentricity of an ellipse is greater than unity
(D) The eccentricity of a hyperbola is less than unity
(1) A, B (2) A, D (3) B, C (4) C, D

40. $\lim\limits_{x \to \infty} \dfrac{3^{x+1}+4}{3^{x+2}+4} =$

(1) 1 (2) 0 (3) $\dfrac{3}{4}$ (4) $\dfrac{1}{3}$

41. Derivative of $\cos^{-1}\left(\dfrac{1-x^2}{1+x^2}\right)$ with reference to x is

(1) $\dfrac{2}{1+x^2}$ (2) $\dfrac{1}{1-x^2}$ (3) $2x$ (4) $\sqrt{\left(1+x^2\right)}$

42. If $y=x^{3x}, (x > 0)$ then $\dfrac{dy}{dx} =$

(1) $3.x^{3x-1}$ (2) $3x^{2x}$ (3) $3y(1+\log x)$ (4) $\dfrac{3y}{\log x}$

43. If $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ then $\frac{dy}{dx} =$

(1) $\left(\frac{x}{y}\right)^{\frac{1}{3}}$ (2) $-\left(\frac{y}{x}\right)^{\frac{1}{3}}$ (3) $-\left(\frac{x}{y}\right)^{\frac{1}{3}}$ (4) $\left(\frac{y}{x}\right)^{\frac{1}{3}}$

44. The derivative of log sec x with respect to tan x is

(1) $\sec x \cdot \tan x$ (2) $\cos x \cdot \cot x$ (3) $\cos x \cdot \sin x$ (4) $\sec x \cdot \cot x$

45. The coordinates of the point $P(x, y)$ on the curve of $y = x^2 - 4x + 5$ such that the tangent at P is parallel to $y = 2x + 4$ are

(1) (3, 2) (2) (1, 2) (3) (2, 1) (4) (5, 4)

46. The function $f(x) = x \log^2 x$ has

(1) Maximum value occurs when $x = \frac{1}{e}$ (2) Maximum value occurs when $x = e$

(3) Maximum value occurs when $x = e^{-2}$ (4) Maximum value occurs when $x = e^2$

47. In a cube the percentage increase in side is 2 units. The percentage increases in the volume of the cube is

(1) 3 (2) 6 (3) 8 (4) 16

48. The curves $x = y^2$ and $xy = m$ cut at right angle if

(1) $m = 0$ (2) $m^2 = 8$ (3) $8m^2 = 1$ (4) $m = -1$

49. If $u = e^{ax} \sin by$, then $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} =$

(1) $(a^2 - b^2)\, u$ (2) $a^2 + b^2$ (3) $(a^2 + b^2)\, u$ (4) $(a + b)\, u$

50. $\int \frac{\cos \sqrt{x}}{\sqrt{x}} dx =$

(1) $\sqrt{x} \sin \sqrt{x} + c$ (2) $2 \sin \sqrt{x} + c$ (3) $\sqrt{\cos x} + c$ (4) $\frac{\sin \sqrt{x}}{\sqrt{x}} + c$

PHYSICS

51. In thermodynamics, $dQ = 0$ and $dU = -dW$ is true for
(1) Isothermal process (2) Adiabatic process
(3) Isochoric process (4) Isobaric process

52. A sample of an ideal gas has volume V, pressure P and temperature T. The mass of each molecule of the gas is m. The density of the gas is _____
(1) P/kVT (2) mkT (3) mP/kT (4) P/kT

53. A gas does 4.5 J of external work during adiabatic expansion. Its temperature falls by 2 K. Its internal energy will be _____
(1) increase by 4.5 J (2) increase by 9.0 J
(3) decrease by 4.5 J (4) decrease by 2.25 J

54. One mole of an ideal gas ($\gamma = 5/3$) is mixed with one mole of diatomic gas ($\gamma=7/5$). The value of γ of the mixture
(1) 3/2 (2) 4/3 (3) 23/15 (4) 35/23

55. In a given process on an ideal gas, $dW = 0$ and $dQ < 0$. Then for the gas _____.
(1) the temperature will decrease (2) the volume will increase
(3) the pressure will remain constant (4) the temperature will increase

56. The threshold wavelength for a metal whose work function is W_0 is λ_0. The threshold wavelength for a metal whose work function is $W_0/2$ _____
(1) $\lambda_0/4$ (2) $\lambda_0/2$ (3) $4\lambda_0$ (4) $2\lambda_0$

57. The propagation of light through an optical fiber goes by the principle _____
(1) Refraction (2) Total internal reflection
(3) Interference (4) Diffraction

58. The dimensions of angular momentum are _____
(1) MLT^{-1} (2) $ML^{-1}T$ (3) ML^0T^{-2} (4) ML^2T^{-1}

59. The SI unit of universal gas constant R is _____
(1) Newton K^{-1} mol^{-1} (2) Joule K^{-1} mol^{-1}
(3) Watt K^{-1} mol^{-1} (4) erg K^{-1} mol^{-1}

60. The magnitude of the resultant of $(A+B)$ and $(A-B)$ is _____

(1) $2A$ (2) $\sqrt{(A^2+B^2)}$

(3) $2B$ (4) $\sqrt{(A^2-B^2)}$

61. Given A.B = 0 and A×C = 0, the angle between B and C is _____
(1) 135° (2) 90° (3) 180° (4) 45°

62. A projectile has a maximum range of 200m. The maximum height attained by it is _____
(1) 75 m (2) 100 m
(3) 25 m (4) 50 m

63. A block of mass M is lying on a horizontal frictionless surface. One end of a rope mass m is fixed to the block and a force F is applied at the free end parallel to the surface. The force acting on the block will be _____
(1) FM/(M-m) (2) Fm/(M+m)
(3) FM/(M+m) (4) F

64. A block of weight 200 N is pulled along a rough horizontal surface at a constant speed by a force of 100 N acting at an angle of 30°. The coefficient of friction between the block and the surface is _____
(1) 0.58 (2) 0.75 (3) 0.45 (4) 0.65

65. A boy wants to climb down a rope. The rope can withstand a maximum tension equal to two-thirds the weight of the boy. If g is the acceleration due to gravity, the minimum acceleration with which the boy should climb down the rope is _____
(1) g/3 (2) 2g/3 (3) 3g/2 (4) g

66. N bullets each of mass m kg are fired with a velocity v m/s, at the rate of n bullets per second, upon a wall. The reaction offered by the wall to the bullets is given by _____
(1) nNv/m (2) $nNmv$
(3) Nmv/n (4) nNm/v

67. A machine gun fires a bullet of mass 40 g with a velocity of 1200 m/s. The man holding it can exert a maximum force of 144 N on the gun. The number of bullets he can fire per second is _____
(1) 4 (2) 1 (3) 3 (4) 8

68. A horizontal force F pulls a 20 kg box at a constant speed along a horizontal floor. If the coefficient of friction between the box and the floor is 0.25. The work done by the force F in moving the box through a distance of 2 m _____
(1) 49 J (2) 147 J
(3) 196 J (4) 98 J

69. A uniform rod of mass m and length l is made to stand vertically on one end. The potential energy of the rod in this position is _____
(1) mgl/4 (2) mgl/2 (3) mgl (4) mgl/3

70. If momentum is increased by 20%, then kinetic energy increases by _____
(1) 44% (2) 77% (3) 55% (4) 66%

71. A particle is executing linear SHM of amplitude A. When the displacement is half the amplitude the fraction of kinetic energy is _____
(1) 1/5 (2) 3/4 (3) 1/2 (4) 1/4

72. For a particle executing S.H.M starting from equilibrium position the phase is $\pi/2$ when it has
(1) maximum displacement (2) maximum energy
(3) half the displacement (4) maximum velocity

73. A particle executes SHM between $x = -A$ and $x = +A$. The time taken for it to go from 0 to A/2 is T_1 and to go from A/2 to A is T_2. Then
(1) $T_1 = 2T_2$ (2) $T_1 = T_2$
(3) $T_1 < T_2$ (4) $T_1 > T_2$

74. Two sounds of wavelengths 5 m and 6 m, travelling in a medium produce 10 beats per second. The speed of sound in the medium _____
(1) 300 m/s (2) 320 m/s (3) 350 m/s (4) 1200 m/s

75. An observer moves towards a stationary source of sound with a velocity one tenth the velocity of sound. The apparent increase in frequency _____.
(1) 3% (2) 0.1% (3) 5% (4) 10%

CHEMISTRY

76. Glass is corroded by
(1) Fluorine (dry or wet)
(2) Sulphuric acid (concentrated)
(3) Phosphoric acid
(4) Carbonic acid

77. The most resistant material to alkaline corrosion is
(1) Cast iron
(2) Nickel
(3) Aluminium
(4) Brass

78. The monomer of polyvinyl chloride is
(1) Chloro ethene
(2) Ethylene dichloride
(3) Ethyl chloride
(4) Chloroform

79. Polythene is
(1) An addition polymerization product
(2) A condensation polymerization product
(3) Thermosetting
(4) Polymer of amylopectin

80. Teflon is
(1) Phenol formaldehyde
(2) An inorganic polymer
(3) Poly tetrafluoroethylene
(4) A monomer

81. Water gas constitutes mainly of
(1) CO and H_2
(2) CO and N_2
(3) CO_2 and H_2
(4) CH_4 and H_2

82. The lightest particle is
(1) Positron
(2) Neutron
(3) Proton
(4) α-particle

83. If an electron has spin quantum number of +1/2 and magnetic quantum number of –1, it cannot be present in
(1) *d* orbital (2) *f* orbital (3) *p* orbital (4) *s* orbital

84. The ion that is iso electronic with CO is
(1) NO^+ (2) O_2^+ (3) O_2^- (4) N_2^+

85. The hydrogen bond is strongest in
(1) O-H- - -S (2) S-H---O (3) F-H---F (4) F-H---O

86. The molecule having pyramidal shape
(1) PCl_3 (2) SO_3 (3) CO_3^{2-} (4) NO_3^-

87. Crystals of a sodium chloride belong to the system
(1) Orthorhombic (2) Cubic (3) Trigonal (4) Monoclinic

88. The pH of 0.05 M acetic acid is ($K_a = 2\times10^{-5}$)
(1) 2 (2) 11 (3) 10^{-3} (4) 3

89. The volume in ml. of 0.1 M solution of NaOH required to completely neutralize 100 ml of 0.3 M solution of H_3PO_3 is
(1) 60 (2) 600 (3) 300 (4) 30

90. The P^{ka} values of four carboxylic acids are 4.76, 4.19, 0.23 and 3.41 respectively. The strongest carboxylic acid among them is the one having P^{ka} value of
(1) 4.19 (2) 3.41 (3) 0.23 (4) 4.76

91. If pH value of a solution is 8, then its pOH value will be
(1) 7 (2) 1 (3) 6 (4) 10

92. The standard reduction potential for Li^+/Li, Zn^{+2}/Zn; H^+/H_2 and Ag^+/Ag are –3.05, –0.762, 0.000 and +0.80 V respectively. Which is the strongest reducing agent?
(1) Ag (2) H_2 (3) Zn (4) Li

93. The standard reduction potential for the following half-cell reactions are
$Zn = Zn^{+2} + 2e^-$ $E^\circ = -0.76V$
$Fe = Fe^{+2} + 2e^-$ $E^\circ = -0.44V$
The E.M.F. for the cell reaction $Fe^{+2} + Zn \rightarrow Zn^{+2} + Fe$ will be
(1) –0.32 V (2) +0.32 V (3) +1.20 V (4) –1.20 V

94. In salt bridge, KCl is used because
(1) KCl is present in calomel electrode
(2) K^+ and Cl^- ions are not iso electronic
(3) K^+ and Cl^- ions have the same transport number
(4) KCl is an electrolyte

95. The metal that cannot be obtained by electrolysis of aqueous solution of its salt is
(1) Ag (2) Au (3) Cu (4) Al

96. BOD of raw municipal sewage may be about
(1) 2-5 mg/lit (2) 5-10 mg/lit
(3) 150-300 mg/lit (4) 2000-3000 mg/lit

97. The pH value of potable water should be between
(1) 1 to 1.5 (2) 6.5 to 8
(3) 13 to 14 (4) 4 to 5

98. Deaeration of high pressure boiler feed water is done to reduce
(1) Foaming from boilers (2) Its dissolved oxygen content
(3) Its silica content (4) Caustic embrittlement

99. Presence of non-biodegradable substances like alkyl benzene sulphonate from detergents in polluted water stream causes
(1) Fire hazards (2) Explosion hazards
(3) Persistent foam (4) Depletion of dissolved oxygen

100. Presence of soluble organics in polluted water causes
(1) Undesirable plants growth (2) Depletion of oxygen
(3) Fire hazards (4) Explosion hazards

ELECTRICAL AND ELECTRO[illegible]CS ENGINEERING

101. Unit of specific energy consumption is
(1) Watt hour per km
(2) Joule Sec
(3) Killo watt hours
(4) Watt h[illegible] per tonne - Km

102. Trapezoidal speed - time curve pertains to
(1) Urban Service
(2) Mainline S[illegible]ice
(3) Suburban Service
(4) 1 and 3

103. Distance between two stops is 1 Km. The average speed is 36 [illegible]ph, scheduled speed is 30 Kmph. Stopping time is _____ seconds.
(1) 20 (2) 40 (3) 10 (4) 16

104. The friction of track is proportional to
(1) $(Speed)^2$ (2) $\sqrt{Speed}$ (3) Speed (4) [illegible] $\frac{1}{ed}$

105. Free running time is almost zero for
(1) Main line service
(2) Urban service
(3) Suburban service
(4) 2 and 3

106. For agricultural pump - sets _____ type of motor is used
(1) Single phase Induction motor
(2) 3 phase Squirrel cage Induction [illegible]tor
(3) 3 phase slipring Induction motor
(4) 3 phase Synchronous motor

107. In 230V. tube light the purpose of choke is
(1) To provide high voltage for starting ionization process
(2) After the light is on, to limit the voltage across the tube to about 80 V
(3) Both 1 and 2
(4) To make and break the circuit

108. Earthing of equipment is necessary for protection against

(1) Over voltage
(2) Over loading
(3) High temperature of conductor
(4) Danger of Electric - shock

109. The insulation resistance test is performed with

(1) Ohm - meter
(2) Megger
(3) Earth - tester
(4) Wheatstone Bridge

110. In full wave centre tapped rectifier, each diode conducts for a period of _____ degrees

(1) 180 (2) 90 (3) 270 (4) 360

111. Which of the following is a negative resistance device

(1) Junction diode
(2) Zener diode
(3) UJT
(4) BJT

112. For a junction transistor, relation between α and β is

(1) $\alpha = \frac{\beta}{1-\beta}$
(2) $\beta = \frac{\alpha}{1-\alpha}$
(3) $\alpha = \beta + 1$
(4) $\beta = \frac{\alpha}{1+\alpha}$

113. Which of the following configuration is normally used in cascading of Amplifiers

(1) Common emitter
(2) Common base
(3) Common Collector
(4) All the above

114. Voltage gain of CC amplifier or an emitter follower is

(1) Less than ONE
(2) Greater than ONE
(3) Zero
(4) Infinity

115. Which of the following oscillator employs R - C phase shift circuit

(1) Heartly oscillator
(2) Colpits oscillator
(3) Crystal oscillator
(4) Wein Bridge oscillator

116. In R - C phase shift oscillator, the phase shift in each R - C network is _____ degrees

(1) 45 (2) 60 (3) 90 (4) 180

117. Which of the following is not a basic logic gate

(1) AND
(2) NOT
(3) NOR
(4) OR

118. Two input XOR (Exclusive OR) gate has an output of ONE when the two inputs are

(1) 1, 0
(2) 1, 1
(3) 0, 0
(4) All the above

119. A full adder circuit is constructed by using

(1) One half adder and a two input OR gate
(2) Two half adders and a two input OR gate
(3) One half adder and a two input AND gate
(4) Two half adders and a two input AND gate

120. SCR (Silicon - controlled Rectifier) has

(1) 2 junctions, 3 layers
(2) 3 junctions, 3 layers
(3) 4 junctions, 5 layers
(4) 3 junctions, 4 layers

121. SCR goes into full conduction when _____

(1) Forward voltage is applied between Anode and cathode
(2) Current pulse is applied to the gate
(3) Both 1 and 2
(4) None of these

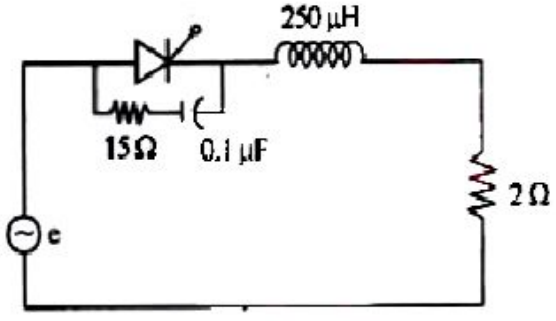
122. The device that can be turned ON by a short positive pulse and turned off by a short Negative pulse to its gate

(1) Gate turn - off Transistor
(2) SCR
(3) DIAC
(4) TRIAC

123. The anode current of SCR must be more than _____ to maintain required amount of carrier flow across the junction

(1) Holding Current
(2) Latching Current
(3) Reverse leakage Current
(4) Forward leakage Current

124. The maximum $\frac{di}{dt}$ for SCR in the circuit is where $e = 440 \sin 314\, t$



(1) 1.76 A/Sec
(2) 17.6 A/Sec
(3) 17.6 A/μ Sec
(4) 1.76 A/μSec

125. A single phase fully controlled bridge converter is a _____ type of converter

(1) ONE quadrant
(2) Three quadrant
(3) Two quadrant
(4) Four quadrant

126. For speed control and braking in Electric - Automobiles _____ are used

(1) Choppers
(2) Converters
(3) Inverters
(4) AC regulators

127. A cycloconverter is a _____

(1) Phase angle changer
(2) Frequency changer
(3) Wave form changer
(4) Amplitude changer

128. Wave form output voltage of a single phase bridge inverter is _____

(1) Pure sinusoidal
(2) Triangular
(3) Trapezoidal
(4) Square wave

129. "Stator voltage control" of an induction motor can be achieved by using _____.

(1) DC chopper
(2) Controlled rectifier
(3) AC voltage controller
(4) Step down cycloconverter

130. Uninterruption Power Supply (UPS) is used in _____

(1) Communication links
(2) Computers
(3) Important instrumentation
(4) All the above

131. The architecture of 8051 is _____

(1) Von Neuman
(2) Harvard Architecture
(3) Distributed Architecture
(4) Both 1 and 3

132. In 8051, the instructions '*anl*' and '*orl*' belongs to _____ instruction set

(1) Data transfer
(2) Arithmetic
(3) Logical
(4) Interrupt flow control

133. Following conditions should satisfy for 8051 to entre programming mode

(1) REST must be high
(2) PSEN must be low
(3) ALE must be high
(4) All the above

134. The status register for 8051 is _____
(1) Program Status Word (PSW) (2) Accumulator registers A and B
(3) Special purpose registers (4) All the above

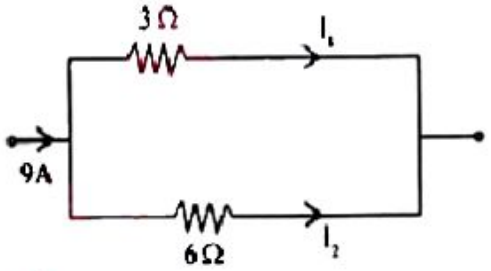
135. Material which has highest conductivity
(1) Gold (2) Silver
(3) Copper (4) Aluminum

136. Inductance L stores energy in _____ field and stored energy is equal to _____
(1) Electric, $\frac{1}{2}LI^2$ (2) Electric, LI^2
(3) Magnetic, $\frac{1}{2}LI^2$ (4) Magnetic, LI^2

137. A capacitor with initial Voltage V_0, at $t = 0^+$ acts as _____
(1) Open circuit (2) Short circuit
(3) Current source V_0 (4) Voltage source V_0

138. Three Resistors each 6 ohms are connected in delta. Its equivalent star connection value.
(1) 6 ohms (2) 18 ohms (3) 2 ohms (4) 3 ohms

139. In the circuit given, I_1, I_2 currents respectively are



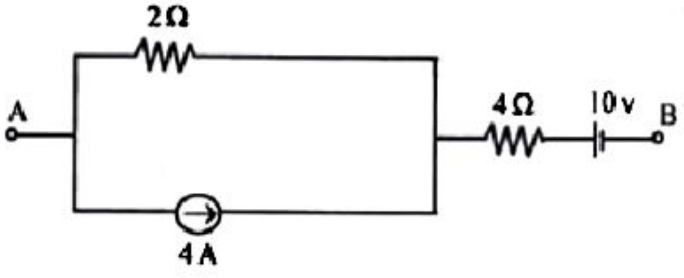
(1) 3A, 6A (2) 6A, 3A
(3) 4.5A, 4.5A (4) 5A, 4A

140. The Battery capacity is expressed in

(1) Watts (2) Amps

(3) Ampere hours (4) Volts

141. Thevenin's equivalent resistance across terminals AB is _____ ohms



(1) 6 (2) 2 (3) 4 (4) 3

142. A lap wound d.c generator has 400 Conductors and 8 poles. The voltage induced per conductor is 2V. The machine generates a voltage of

(1) 200V (2) 400V (3) 100V (4) 800V

143. The d.c machine is provided with interpoles and compensating winding. These are connected in _____ with armature winding.

(1) Parallel

(2) Series

(3) Interpoles in series and compensating in parallel

(4) Interpoles in parallel and compensating in series

144. Which of the following tests require two identical d.c machines.

(1) Swinburne's (2) Brake test

(3) Hopkinson (4) Retardation test

145. The frequency of induced emf in d.c generator

(1) $\frac{PN}{60}$ (2) $\frac{PN}{30}$ (3) $\frac{PN}{40}$ (4) $\frac{PN}{120}$

146. The efficiency of d.c machine is maximum when variable losses are equal to
(1) Constant Losses (2) Zero
(3) Half of constant losses (4) Twice constant losses

147. D.C motor used for lifts and Hoists
(1) Shunt (2) Series
(3) Differential Compound (4) Cumulative Compound

148. A D.C. shunt motor is operating at 1000rpm supplying full load. Suddenly field winding is opened. The speed of the motor is
(1) Zero (2) 1000rpm
(3) 500rpm (4) Tends to go to infinity

149. 220V D.C. shunt motor has armature resistance of 0.5ohms. If the back emf is 200V, the current drawn by motor is
(1) 400A (2) 440A (3) 40A (4) 80A

150. Dynamometer type instruments are generally used for measurement of
(1) Power (2) Voltage (3) Current (4) Energy

151. LVDT is a _____ type of transducer
(1) Capacitive (2) Inductive
(3) Resistive (4) Strain

152. PMMC instrument scale is _____ and is used to measure _____ quantity
(1) Uniform, d.c (2) Non-uniform, d.c
(3) Uniform, a.c (4) Non uniform, a.c

153. Anderson bridge is used to measure
(1) Capacitance (2) Resistance
(3) Inductance (4) Strain

154. The RMS value of triangular 

wave form of V volts

(1) $\frac{V}{2}$ (2) $\frac{V}{\sqrt{3}}$ (3) $\frac{V}{\sqrt{2}}$ (4) $\frac{V}{3}$

155. In two wattmeter method of measuring power, one of the wattmeter reads zero, when the power factor is

(1) 0.5 (2) Zero (3) UPF (4) 0.8

156. In a R - L - C series circuit R = 3 ohms X_L = 2 ohms, X_C = 6 ohms, the power factor is

(1) 0.4 lead (2) 0.6 lag (3) 0.6 lead (4) 0.4 lag

157. A series R - L - C circuit with R = 10Ω is connected to 100V a.c supply. When the circuit is under resonance, the current is _____ amps and power factor is _____.

(1) 10A, 0.5p.f (2) 10A, UPF
(3) 10A, 0.8pf (4) 10A, zero p.f

158. f_1 and f_2 are, Lower and Upper half power frequencies, Resonant frequency is

(1) $\frac{f_1 + f_2}{2}$ (2) $f_1 f_2$ (3) $\sqrt{\frac{f_1 + f_2}{2}}$ (4) $\sqrt{f_1 f_2}$

159. Two winding transformer is _____ linked

(1) Conductively (2) Electrically
(3) Magnetically (4) Both 2 and 3

160. If rated d.c Voltage, instead of a.c Voltage is applied to primary of the transformer

(1) Secondary will burn (2) Primary will burn
(3) Secondary Voltage is high (4) None of these

161. A transformer steps up voltage by a factor 100. Ratio of primary to secondary currents is

(1) 1 (2) 0.1 (3) 0.01 (4) 100

162. A transformer has 2% resistance voltage drop and 4% reactance voltage drop. The regulation at 0.8 p.f leading is

(1) 0.8 (2) 4 (3) –0.8 (4) –4

163. No load test of transformer 1000V/100V is conducted with 100V side open and wattmeter reads 110 W. If the No-load test is conducted with 1000V side open, the reading of wattmeter is

(1) 110W (2) 11W (3) 1100W (4) 220W

164. If P_i = iron loss, P_c = full load copper loss, the maximum efficiency occurs at 3/4 full load. Then $\frac{P_i}{P_c}$ is

(1) $\frac{3}{4}$ (2) $\frac{9}{16}$ (3) $\frac{16}{9}$ (4) $\frac{4}{3}$

165. The Hysteresis loss of a transformer at 25 Hz frequency is 40W. At 50 Hz frequency the loss will be

(1) 40W (2) 160W (3) 20W (4) 80W

166. If $\propto$ is the short pitch angle, the pitch factor of alternator is

(1) Cos $\propto$ (2) $Cos \frac{\propto}{2}$ (3) Sin $\propto$ (4) Sin $\frac{\propto}{2}$

167. In an alternator the reactive power is controlled by changing

(1) Excitation (2) Prime mover input
(3) Phase sequence (4) Prime - mover speed

168. In an alternator, the armature reaction effect is completely demagnetizing when the power factor is

(1) UPF (2) 0.5 Lead (3) Zero lag (4) Zero lead

69. 3 phase synchronous motor has
(1) Very high starting torque
(2) Zero starting torque
(3) Very low starting torque
(4) 50% of full load torque at starting

170. The synchronous motor acts as synchronous condenser when excitation is
(1) 100% normal
(2) Under excitation
(3) Over excitation
(4) None of these

171. As the load on synchronous motor is increased, the speed
(1) Decreases
(2) Increases
(3) Remains constant for some time and falls rapidly
(4) Remain constant and load angle is increased to meet additional load.

172. 3 phase, 400V, 50Hz induction motor is running at 4% slip. The frequency of rotor induced emf is
(1) 50Hz (2) 2Hz (3) 4Hz (4) 20Hz

173. In terms of air gap power P_g, slip S, copper loss : Mechanical power developed of Induction motor is
(1) $SP_g : (1-S) P_g$
(2) $(1-S) P_g : SP_g$
(3) $SP_g : \frac{Pg}{S}$
(4) $SP_g : \frac{Pg}{1-S}$

174. r_2, x_2 are stand still resistance and reactance of induction motor, s is the slip. Condition for Maximum torque is
(1) $r_2 = (1 - s) x_2$ (2) $x_2 = s r_2$ (3) $r_2 = s x_2$ (4) $r_2 = x_2 / s$

175. In a 3 phase induction motor, developed torque T in terms of supply voltage V is proportional to
(1) V
(2) V^2
(3) $\sqrt{V}$
(4) $\frac{1}{V^2}$

176. _____ single phase induction motor has high starting torque

(1) Shaded pole (2) Split phase

(3) Capacitor run (4) Capacitor start

177. _____ motor used in computer controlled devices

(1) Universal motor (2) Induction motor

(3) Stepper motor (4) Reluctance motor

178. Effect of water hammer can be eliminated by using

(1) Spill way (2) Surge tank

(3) Draft tube (4) Fore-bay

179. Overall efficiency of thermal power plant

(1) $\eta_{boiler} \times \eta_{turbine}$ (2) $\eta_{turbine} \times \eta_{gen}$

(3) $\eta_{boiler} \times \eta_{coal\ plant} \times \eta_{gen}$ (4) $\eta_{boiler} \times \eta_{turbine} \times \eta_{gen}$

180. Load factor of power plant

(1) $\frac{Average\ demand}{Max\ demand}$ (2) $\frac{Average\ demand}{Plant\ Capacity}$

(3) $\frac{Max\ demand}{Connected\ demand}$ (4) $\frac{Max\ demand}{Average\ demand}$

181. _____ used to extract heat from flue gases for heating feedwater to boiler

(1) Super heater (2) Air preheater

(3) Economiser (4) Condenser

182. _____ material is used for controlling chain reaction in Nuclear Reactor

(1) Thorium (2) Boron (3) Heavy water (4) Beryllium

183. _____ Relay is used for protection of short transmission lines.

(1) Reactance (2) Impedance

(3) MHO (4) Over current

184. Buchholz relay is Housed in _____ of the transformer

(1) Trans former tank

(2) Conservator

(3) Pipe line connecting transformer tank and conservator

(4) Transformer bushing

185. For protection of star/ delta power transformer, the CTs of differential protection of transformer are connected in

(1) star / delta (2) delta / star

(3) delta / delta (4) star / star

186. _____ Relay used for protection of 3 phase alternator stator faults

(1) Over current relay (2) Distance relay

(3) Buchholz relay (4) Differential relay

187. The making current of C.B is _____ times of breaking current

(1) 2 (2) 3 (3) 2.55 (4) 3.55

188. The length of short transmission line is up to about _____ km.

(1) 80 (2) 150 (3) 200 (4) 300

189. To increase the power transmission through the transmission line, which of the following parameter is to be decreased

(1) Voltage (2) Line inductance

(3) Line capacitance (4) Line resistance

190. For level supports, the sag is given by

(1) $\frac{Wl^2}{3T}$ (2) $\frac{Wl}{8T}$ (3) $\frac{Wl^2}{8T}$ (4) $\frac{Wl^2}{6T}$

191. $\begin{bmatrix} A & B \\ C & D \end{bmatrix}$ Parameters of short line

(1) $\begin{bmatrix} 1 & 0 \\ 1 & Z \end{bmatrix}$ (2) $\begin{bmatrix} 1 & Z \\ 0 & 0 \end{bmatrix}$ (3) $\begin{bmatrix} 1 & 1 \\ Z & 1 \end{bmatrix}$ (4) $\begin{bmatrix} 1 & Z \\ 0 & 1 \end{bmatrix}$

192. Which of the following power distribution system gives better reliability

(1) Radial system (2) Ringmain system
(3) D.C. 3 - wire system (4) Tapered distribution

193. Due to Ferranti effect on long line, the sending end voltage V_s and receiving end voltage V_r are related

(1) $V_s = V_r$ (2) $V_s > V_r$ (3) $V_s < V_r$ (4) $V_s = \frac{V_r}{2}$

194. In H.V D.C transmission, the d.c voltage of d.c line Vd in terms of firing angle $\propto$ is proportional to

(1) $\cos \propto$ (2) $\cos \frac{\propto}{2}$ (3) $\sin \propto$ (4) $\tan \propto$

195. The sag of a transmission line is least affected by _____

(1) Self weight of conductor (2) Temperature of surrounding air
(3) Current through conductor (4) Ice deposit on conductor

196. The corona loss is reduced using _____ conductor

(1) Large diameter (2) Hollow
(3) Bundled (4) All of these

197. The medium transmission lines are represented by

(1) Equivalent T (2) Equivalent π

(3) 1 or 2 (4) Series impedance Z

198. The distance between two stations in case of urban service

(1) < 1 km (2) > 1 km (3) 10 km (4) 100km

199. The scheduled speed is always _____ the average speed

(1) Greater than (2) Less than

(3) Equal to (4) None of these

200. Long distance railway traction operates on

(1) 600 D.C (2) 400 V, 3 phase a.c

(3) 25 KV, single phase (4) 15 KV, 3 phase a.c